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A CANADIAN COAL DATA BASE USING A COMMERCIAL DATA MANAGEMENT PROGRAM FOR MS-DOS TYPE MACHINE

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by

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ABSTRACT

Reorganization of the Coal Research Laboratories of CANMET has reduced the manhours available for compiling productivity reports on the Canadian coal mining industry. For the project to continue and to make better use of the available data, it was decided to utilize a computer data base with graphics. This report gives a description of the system used and samples of output for inclusion in CANMET's biennial report on coal reserves and production.

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UNE BASE DE DONNÉES SUR LE CHARBON CANADIEN AU MOYEN D'UN PROGRAMME COMMERCIAL DE GESTION DES DONNÉES POUR UNE MACHINE MUNIE D'UN MS-DOS

par

H.G. Naidu*, N.J. Stuart** et P. Lal***

RÉSUMÉ

La réorganisation des Laboratoires de recherche sur le charbon du CANMET a entraîné une réduction du nombre d'heures-personnes pour compiler les rapports de productivité de l'industrie de l'exploitation du charbon au Canada. Afin de poursuivre le projet et de faire une meilleure utilisation des données disponibles, il a été convenu d'utiliser une base de données informatisées avec graphiques. Le présent rapport donne une description du système utilisé et fournit des échantillons de sortie de données qui seront inclus dans le rapport bisannuel du CANMET sur les réserves et la production de charbon.

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INTRODUCTION

Prior to the energy crisis in the 70's, no systematic assessment was done or statistics kept on Canada's coal reserves. Three bodies publish related information on coal:

- Statistics Canada publishes information on production, manpower, quantity exported and imported, etc.
- Energy strategy group of EMR publishes information on production, sales, manpower distribution of individual mines.
- The Geological Survey have a long term project to create a coal resource data base.

With the increased interest in coal, CRL/CANMET created the "Reserve Assessment Group". This group kept track of mineable reserves, mine production, mining method, coal quality etc. However, it did not attempt to analyze the data for productivity.

In 1986 the Coal Research Laboratories were reorganized giving lower manhours to reserve assessment. The project detailed in this report is an attempt to automate the collation of data and the production of reports summarizing trends in reserves, production and productivity.

DATA AND DATA BASES

A "data base" is defined as "a collection of data with a system of cross references". In general, data in a computer data base are grouped into "records" which are in turn stored in "files". In addition to files containing original data the system will create files containing cross-referencing data. Both files and records may be thought of as "data abstractions". These are concepts the programmer uses but does not generally worry about how the computer realizes them at the lowest level.

If one wishes to store some production data for a mine on a weekly basis one will have a record structure that had a "field" which will indicate the date of the week in question and a number of fields that held the production "values" (tonnages) for the various points of production. The total collection of records might be put into a file. Historically, the construction of data bases has been a major task for the corporate data processing market. In recent years the emphasis has changed from creating

systems with fast access times to creat flexible and user's friendly systems. This has resulted in the migration from heirachial structures to "relational" data bases in the creation of English like query languages (the so-called 4GLs - fourth generation languages) and the bundling of graphics and report writing software with the data base.

The "Smart" system used here was created for personal computers and claims to be "relational" - there tends to be some debate over what constitutes a fully relational data base. Additionally this system comes with graphics, a programming language and other integrated features that constitute a very flexible environment. Data bases for multi-user machines are more difficult to create than for single user machines. This with the vastly greater market for P.C. software, makes data bases for P.C.S. about 3 per cent of the cost of those available for the Digital "VAX/VMS" systems.

FILE TYPES

The data base created under the "SMART" system for this application uses a number of files and file types. The following is a list of file types used. File type extensions are given in brackets.

FILE TYPES USED IN THE DATA BASE MODULE

(1) Data base files (DB)

Two data base files are used - the master data base and a second data base that contains the data that is unlikely to change for a given mine.

(2) Lookup Definitions (DFL)

The "lookup" command is used to move data from the secondary data base to the master data base. To define the connection between the two files the option "define" is used within this command - this creates the "lookup" definition file".

(3) Report Definitions (DFR)

The "define" option in the "report" command creates a report definition file. These files are used to print tables (see output e.g.s.).

(4) Sort Definitions (DFS) and Index Files (IDX)

An index file is a list of references to the records in a data base that are maintained in a specific order. Typically the records in the master file may be in no particular order. Should one require to produce a list of the mines in descending order of production one might create an "Index file" by the "Production" field. Alternatively, one might create a key file based upon province, coalfield and then alphabetically within the coalfield by mine name - i.e. more than one "key field" may be used. Since index files are not automatically updated when the data-base file is changed, it is handy to have there definition files stored so that they can be easily updated.

(5) Summary Definitions (DFW)

The summaries of the parts of the data base were created prior to sending the data to the Spreadsheet module. Summaries are created as an option in the "send" command used to move data between modules.

ADDITIONAL FILE TYPES USED BY THE SPREADSHEET MODULE TO CREATE GRAPHICS:

(1) Work Sheets (WS)

Data moved over from the data manager arrives in work-sheet files, the equivalent of the data base file.

(2) Graph Definition Files (GDF)

Graphs are defined using the "define" option in the graphics command. The graph definition file created in this process contains all the information necessary to find the data in the spreadsheet and create a graph of a specified type. These definitions are used with other options in the graphics command to send the graph to the screen, plotter, printer or the smart word processor.

(3) Graph Screen Files (SCN)

When a graph is sent to the screen the image may be stored in a screen file. This is convenient for creating slide show type presentation

THE DATA BASE STRUCTURE

A record in the main data base file "dbpunam.db" constitutes the data for one mine for one year. Table 1 gives a listing of the fields stored. In addition, there are "calculated fields". These are not stored as data but are calculated from other fields as needed. For example, the "manpower total" field is calculated by summing all the fields from "Miners S" to "Admin UG".

Currently there are three years' data in the data base (1981-83), giving 124 records using a storage of 44Kbytes. This is a modest memory requirement by the standards of todays micros but never the less constitutes a fair amount of effort in data gathering and entry.

The "lookup.db" data base contains one record for each mine. This data can be copied across the main data base when entering a new years data. Assuming that the values stored in "lookup.db" have not changed, they do not need to be reentered. Fields in the "lookup.db" data base are: Ash, Moisture, Fixed Carbon, Volatile Matter, Sulphur, Heat Value, Seams worked, Thickness and Dip.

DATA ENTRY

To enter an additional years data, one might take the following steps:

(1) Use "Enter" and "Lookup" commands and the existing "lookup" definition to create new records and transfer data from the "lookup.db" file. Care should be taken with the "lookup" function so that it does not overwrite existing records from previous years.

(2) Enter the remaining field values.

(3) Update the key files and produce updated tables from the data manager module.

(4) Send the data to the spreadsheet for the production of up to date graphics.

Note the data base "dbpunam.db" includes a "custom screen". Using this makes data entry a little easier as the fields are displayed more clearly and in a less criptic fashion.

THE COAL DATA

Reserves

It is extremely important to know the ultimate potential as well as the current reserves of the country. Furthermore, reserves figures with any additional qualification provide a much more useful picture. These qualifications are:

- coal in mineable seams
- recoverable reserves
- clean coal reserves
- reserves by rank and by type
- reserves by mining method
- reserves by Province, Region and Coalfield

Though the above information exists with different companies and are also available on request, no comprehensive study has ever been made nationwide to process these to obtain meaningful outputs. In addition to the quantity, information on quality e.g. heat value, ash, moisture, volatile matter, fixed carbon and sulphur, has also been included which are very useful for the customers. It is planned to include more detailed quality information in future (e.g. free swelling index, hardgrove index, ash fusibility temperature, trace elements etc.).

Production and Manpower

For general statistical purpose, it may be sufficient to know the production of coal and manpower employed in the industry. But for technical or commercial purposes it provides no information why the output per man per year at Saskatchewan mines is over 16000 tonnes compared to only 700 to 800 tonnes at the mines in Nova Scotia. An analysis of the mining conditions will indicate coal in the two provinces is produced not only under completely different mining conditions but also using different methods. Also it become difficult to compare Canada's performance figures with those from the other competing countries. While setting up this file, utmost care was taken to include all the pertinent information relating to the mine, equipment, mining method, processing, manpower distribution, etc. It is also intended to include information on cost specially the revenue earned from coal export.

Necessary programs have been written to process the above information to obtain the following outputs:

- raw coal production by province, region, coalfield, mine, coal rank, coal type, mining method, etc.
- saleable coal production
- productivity of:
  (1) surface mine operations by individual mine, mining method, coalfield, region, province and nation,
  (2) underground mines by section, mine, mining method, coalfield, region, province and nation,
  (3) overall mining operation.

In addition, an analysis of mine performance based on total material handled (coal and rock).

The above mentioned information is extremely important for coal consumers, government policy makers, industry engineers, researchers, new enterpreneurs and manufacturers.

The file has been created to facilitate updating as well as technological review at all times. If needed new programs can be added to the system to obtain specific information on the required format.

POTENTIAL EXTENDED USE OF THE SYSTEM

It is hoped that the computer used for the data base work will acquire a hard disc. A drawback of the system as currently found is that to create graphics from the data base files requires a lot of manipulation of floppy discs. This would be eliminated with a hard disc.

Part of the SMART system is an integrated word processor that accepts graphics. This could be used for generating the annual reports of coal reserves. However, the present printers, that produce adequate colour graphics produce substandard text and vice versa. One possibility would be to issue the report on a floppy disc. Since SMART permits the creation of non licensed programs these reports could take an interactive form.

Currently the plan is to extend the data base annually and produce an updated report with minimum effort.

CONCLUSION

The use of the commercial data base system has proved an efficient method of storing coal mine productivity data (in terms of manhours and costs). The acquisition of a hard disc for the microcomputer will greatly speed the process so that the annual generation of statistical summaries in graphical and tabular form becomes routine, requiring few manhours. Additionally, a critical analysis of the data is possible providing information on productivity by an individual mine, coalfield and mining method.

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Table 1 - Field Specification of DBPUNAM.DB

Field No.	Field Title	Type	Length	Key	Total	Status
1	Year	NO	2	Y	N	N
2	Province	A	25	Y		N
3	Coalfield	A	25	N		N
4	Mine	A	25	N		N
5	Operator	A	25	N		N
6	Owner	A	25	N		N
7	Address	A	40	N		N
8	Coal Rank	A	6	N		N
9	Mining Method	A	10	N		N
10	C/Mineable Seams	N1	10	N	Y	N
11	C/Recov MT	N1	10	N	Y	N
12	C/Clean MT	N1	10	N	Y	N
13	C/Recov PJ	N1	10	N	Y	N
14	Ash	N1	4	N	N	N
15	Moisture	N1	4	N	N	N

Field No.	Field Title	Type	Length	Key	Total	Status
16	Fixed Carbon	N1	4	N	N	N
17	Volatile Matter	N1	4	N	N	N
18	Sulphur	N2	6	N	N	N
19	Heat Value (MJ/KG	N1	5	N	N	N
20	Seams Worked	A	25	N		N
21	Thickness m	A	20	N		N
22	Dip*	A	20	N		N
23	C/Raw MT	N2	5	N	N	N
24	C/Saleable MT	N2	5	N	N	N
25	C/Value Sale $M	N2	6	N	N	N
26	Raw Type	A	5	N		N
27	Q Overbn Rem mcu	N1	16	N	N	N
28	C/Raw Washed MT	N1	5	N	Y	N
29	C/Clean Prod MT	N1	5	N	Y	N
30	Backhoe	NO	2	N	N	N

Field No.	Field Title	Type	Length	Key	Total	Status
31	Dragline	A	2	N		N
32	Drill	NO	2	N	N	N
33	Dozer	NO	2	N	N	N
34	Front End Loader	NO	2	N	N	N
35	Shovel	NO	2	N	N	N
36	Truck	NO	10	N		N
37	Other	A	2	N	N	N
38	Continuous Miner	NO	2	N	N	N
39	Drill	NO	2	N	N	N
40	Roof Bolter	NO	2	N	N	N
41	Shearer	NO	2	N	N	N
42	Shuttle Car	NO	2	N	N	N
43	Miners S	NO	4	N	N	N
44	Coal Prep S	NO	4	N	N	N
45	Others S	NO	4	N	N	N

Field No.	Field Title	Type	Length	Key	Total	Status
46	Admin S	NO	4	N	N	N
47	Miners UG	NO	4	N	N	N
48	Coal Prep UG	NO	4	N	N	N
49	Others UG	NO	4	N	N	N
50	Admin UG	NO	4	N	N	N
51	Manpower Total	NOC	8	N	N	N
52	Pit Productivity	N2C	12	N	N	N
53	Min Productivity	N2C	12	N	N	N
54	Ove Productivity	N2C	12	N	N	N
55	Sur Productivity	N2C	12	N	N	N
56	UG Productivity	N2C	12	N	N	N
57	Strip Ratio	N2C	12	N	N	N
58	Remarks	A	10	N		N

APPENDIX A - SAMPLE OUTPUT

REPORT TABLE 2

Table 2
Estimates of Coal Reserves in Canada (MT) 01/03/87

Year	Province	Coalfield	Coal Rank	C/Mineable Seams	C/Recov MT	C/Clean MT
83	Saskatchewan	Estevan	lig	0.0	0.0	0.0
				2113.5	1682.0	1682.0
				0.0	0.0	0.0
				0.0	0.0	0.0
		Willow Bunch	lig	0.0	0.0	0.0
			Provincial Total	2113.5	1682.0	1682.0
	Nova Scotia	Cumberland-Springhil l	hvb	0.1	0.1	0.0
		Inverness	hvb	2.8	1.4	0.0
		Pictou	hvb	0.2	0.1	0.0
		Sydney	hvb	0.0	0.0	0.0
				797.0	436.0	336.0
				0.0	0.0	0.0
			Provincial Total	800.1	437.6	336.0
	New Brunswick	Minto	hvb	4.8	4.7	0.0
		Beersville	hvb	13.6	12.2	0.0
			Provincial Total	18.4	16.9	0.0
	Alberta Plains	Ardley	sub	1.8	1.5	0.0
		Battle River	sub	145.0	87.0	0.0
				0.0	0.0	0.0
				0.0	0.0	0.0
		Drumheller	sub	42.0	10.5	0.0
		Mayerthorp	sub	3.1	2.0	0.0
		Morinville	sub	12.7	8.3	0.0
		Red Deer	sub	6.0	4.4	0.0
		Sheerness	sub	170.0	126.0	0.0
		Thorhild-Abee	lig	1.6	1.2	0.0
		Tofield-Dodds	sub	1.3	1.0	0.0
		Wabamun	sub B	660.0	507.0	0.0
				0.0	0.0	0.0
		Wetaskiwin	sub	250.0	155.0	0.0
			Provincial Total	1293.5	903.9	0.0
	Alberta Foothills	Coalspur	hvb BC	248.0	207.0	70.0
		McLeod River	hvb	300.0	254.0	0.0
		Obed Marsh	hvb	188.0	147.0	0.0
			Provincial Total	736.0	608.0	70.0
	Alberta Mountains	Cadomin-Luscar	mvb	0.0	0.0	0.0
				177.0	87.0	67.5

MT-Mega Tonnes

Year	Province	Coalfield	Coal Rank	C/Mineable Seams	C/Recov MT	C/Clean MT
83	Alberta Mountains	Smoky River	lvb	419.0	161.0	114.0
			Provincial Total	596.0	248.0	181.5
	British Columbia	Comox	hvb	16.0	15.0	0.0
		Crowsnest	mvb	575.0	455.0	384.0
				0.0	0.0	0.0
				0.0	0.0	0.0
		Elk Valley	mvb	0.0	0.0	0.0
			m-hvb	0.0	0.0	0.0
			bm	1145.0	1085.0	725.0
		Peace River	mvb	0.0	0.0	0.0
				757.0	507.0	355.0
			Provincial Total	2493.0	2062.0	1464.0
			Year Total	8050.5	5958.4	3733.5

MT-Mega Tonnes

Table 2
Estimates of Coal Reserves in Canada (MT) 01/03/87

Year	Province	Coalfield	Coal Rank	C/Mineable Seams	C/Recov MT	C/Clean MT
82	Nova Scotia	Cumberland-Springhill		0.1	0.1	0.1
		Inverness	hvb	2.8	1.4	1.4
		Pictou		0.2	0.1	0.0
		Sydney	hvb	809.0	443.0	339.0
				0.0	0.0	0.0
				0.0	0.0	0.0
			Provincial Total	812.1	444.6	340.5
	New Brunswick	Minto	hvb	5.8	5.7	5.7
		Beersville		13.6	12.2	12.2
			Provincial Total	19.4	17.9	17.9
	Saskatchewan	Estevan	lig	2121.0	1697.0	1697.0
				0.0	0.0	0.0
				0.0	0.0	0.0
				0.0	0.0	0.0
		Willow Bunch	lig	0.0	0.0	0.0
			Provincial Total	2121.0	1697.0	1697.0
	Alberta Plains	Alix	sub	4.2	2.9	0.0
		Ardley	sub	1.8	1.5	0.0
		Battle River	sub C	148.0	90.0	90.0
			sub C	0.0	0.0	0.0
				0.0	0.0	0.0
		Sheerness	sub C	170.0	126.0	126.0
		Wabamun	sub B	675.0	518.0	0.0
				0.0	0.0	0.0
		Drumheller	sub	42.0	10.5	0.0
		Mayerthorpe	sub	3.1	2.0	0.0
		Morinville	sub	12.7	8.3	0.0
		Red Deer	sub	6.0	4.4	0.0
		Thorhild Abee	lig	1.6	1.2	0.0
		Tofield Dodds	sub	1.3	1.0	0.0
		Wetaskiwin	sub	250.0	155.0	0.0
			Provincial Total	1315.7	920.8	216.0
	Alberta Foothills	Coalspur	hvb BC	153.0	125.0	0.0
		Obed Marsh	hvb	188.0	147.0	91.0
		Cadomin-Luscar	mvb	182.0	91.0	70.0
			Provincial Total	523.0	363.0	161.0

MT-Mega Tonnes

Estimates of Coal Reserves in Canada (MT) 01/03/87

Year	Province	Coalfield	Coal Rank	C/Mineable Seams	C/Recov MT	C/Clean MT
82	British Columbia	Comox		16.0	15.0	10.0
		Crowsnest	mvb	596.0	472.0	397.0
				0.0	0.0	0.0
				0.0	0.0	0.0
				0.0	0.0	0.0
		Elk Valley	lvb-mv	1166.0	1102.0	735.0
			mvb	0.0	0.0	0.0
			m-hvb	0.0	0.0	0.0
			Provincial Total	1778.0	1589.0	1142.0
	Alberta Mountains	Smoky River	lvb	422.0	163.0	117.0
				0.0	0.0	0.0
			Provincial Total	422.0	163.0	117.0
			Year Total	6991.2	5195.3	3691.4

MT-Mega Tonnes

Table 2
Estimates of Coal Reserves in Canada (MT) 01/03/87

Year	Province	Coalfield	Coal Rank	C/Mineable Seams	C/Recov MT	C/Clean MT
81	Nova Scotia	Inverness	hvb	2.8	1.4	0.0
		Sydney	hvb	814.0	447.0	342.0
				0.0	0.0	0.0
				0.0	0.0	0.0
			hvb A	0.0	0.0	0.0
			Provincial Total	816.8	448.4	342.0
	New Brunswick	Minto	hvb	5.8	5.7	5.7
			lig	5.8	5.7	5.7
			Provincial Total	11.6	11.4	11.4
	Saskatchewan	Estevan	lig	0.0	0.0	0.0
				0.0	0.0	0.0
				0.0	0.0	0.0
				0.0	0.0	0.0
		Estevan (Willowbunch)	lig	0.0	0.0	0.0
			Provincial Total	0.0	0.0	0.0
	Alberta Plains	Battle River	sub C	152.0	93.0	0.0
				0.0	0.0	0.0
				0.0	0.0	0.0
		Sheerness	sub C	170.0	126.0	0.0
		Wabamun	sub B	687.0	529.0	0.0
			Provincial Total	1009.0	748.0	0.0
	Alberta Mountains	Cadomin-Luscar	mvb	185.0	94.0	76.0
		Smoky River	lvb	424.0	165.0	115.0
				0.0	0.0	0.0
			Provincial Total	609.0	259.0	191.0
	British Columbia	Crowsnest	mvb	608.0	482.0	405.0
				0.0	0.0	0.0
				0.0	0.0	0.0
		Elk Valley	lvb-mv	1173.0	1108.0	740.0
			mvb	0.0	0.0	0.0
			m-hvb	0.0	0.0	0.0
		Peace River	mvb	759.0	509.0	357.0
				0.0	0.0	0.0
		Hat Creek	lig	739.0	566.0	0.0
			Provincial Total	3279.0	2665.0	1502.0
			Year Total	5725.4	4131.8	2046.4

MT Mega Tonnes

Table 2
Estimates of Coal Reserves in Canada (MT)

01/03/87

Year	Province	Coalfield	Coal Rank	C/Mineable Seams	C/Recov MT	C/Clean MT
82	British Columbia	Hat Creek		0.0	0.0	0.0
		Peace River	mvb	757.0	507.0	0.0
			Provincial Total	757.0	507.0	0.0
			Year Total	757.0	507.0	0.0

MT-Mega Tonnes

Table 4

Estimates of Coal Reserves in Canada (MT) 01/03/87

Year	Province	Coalfield	Coal Rank	C/Mineable Seams	C/Recov MT	C/Clean MT
81	Nova Scotia	Cumberland-Springhill	hvb	0.1	0.1	0.0
		Pictou	hvb	0.2	0.1	0.0
		Sydney	hvb	0.0	0.0	0.0
			Provincial Total	0.3	0.2	0.0
	New Brunswick	Beersville	hvb	13.6	12.2	12.2
	Alberta Plains	Drumheller	sub	41.0	10.0	0.0
		Wetaskiwin	sub	250.0	155.0	0.0
			Provincial Total	291.0	165.0	0.0
	Alberta Foothills	Obed Marsh	bt	145.0	110.0	0.0
	British Columbia	Comox	hvb	16.0	15.0	10.0
			Year Total	465.9	302.4	22.2

MT-Mega Tonnes

Table 2
Estimates of Coal Reserves in Canada (MT)

01/03/87

Year	Province	Coalfield	Coal Rank	C/Mineable Seams	C/Recov MT	C/Clean MT
83	Alberta Plains	Alix	sub	4.2	2.9	0.0

MT-Mega Tonnes

Table 2
Estimates of Coal Reserves in Canada (MT) 01/03/87

Year	Province	Coalfield	Coal Rank	C/Mineable Seams	C/Recov MT	C/Clean MT
81	Alberta Foothills	Coalspur	hvb BC	158.0	130.0	78.0
	Alberta Plains	Wabamun	sub			
			Year Total	158.0	130.0	78.0

MT-Mega Tonnes

REPORT TABLE 3

Table 3
Coal Reserves in Canada by Rank 1 March 1987

Year	Coal Rank	Province	Coalfield	Mineable Seams(MT)	Recoverble Coal (MT)	Clean Coal (MT)
83	lig	Saskatchewan	Estevan	0.0	0.0	0.0
				2113.5	1682.0	1682.0
				0.0	0.0	0.0
				0.0	0.0	0.0
			Willow Bunch	0.0	0.0	0.0
			Rank Total	2113.5	1682.0	1682.0
	hvb	Nova Scotia	Cumberland-Springhill	0.1	0.1	0.0
			Inverness	2.8	1.4	0.0
			Pictou	0.2	0.1	0.0
			Sydney	0.0	0.0	0.0
				797.0	436.0	336.0
				0.0	0.0	0.0
		New Brunswick	Minto	4.8	4.7	0.0
			Beersville	13.6	12.2	0.0
			Rank Total	818.5	454.5	336.0
	sub	Alberta Plains	Ardley	1.8	1.5	0.0
		Alberta Plains	Battle River	145.0	87.0	0.0
	sub	Alberta Plains	Battle River	0.0	0.0	0.0
				0.0	0.0	0.0
			Rank Total	0.0	0.0	0.0
	sub	Alberta Plains	Drumheller	42.0	10.5	0.0
			Mayerthorp	3.1	2.0	0.0
			Morinville	12.7	8.3	0.0
			Red Deer	6.0	4.4	0.0
			Sheerness	170.0	126.0	0.0
			Rank Total	233.8	151.2	0.0
	lig	Alberta Plains	Thorhild-Abee	1.6	1.2	0.0
	sub	Alberta Plains	Tofield-Dodds	1.3	1.0	0.0
	sub B	Alberta Plains	Wabamun	660.0	507.0	0.0
				0.0	0.0	0.0
			Rank Total	660.0	507.0	0.0
	sub	Alberta Plains	Wetaskiwin	250.0	155.0	0.0
	hvb BC	Alberta Foothills	Coalspur	248.0	207.0	70.0
	hvb	Alberta Foothills	McLeod River	300.0	254.0	0.0
			Obed Marsh	188.0	147.0	0.0
			Rank Total	488.0	401.0	0.0
	mvb	Alberta Mountains	Cadomin-Luscar	0.0	0.0	0.0

Table 3
Coal Reserves in Canada by Rank

1 March 1987

Year	Coal Rank	Province	Coalfield	Mineable Seams(MT)	Recoverble Coal (MT)	Clean Coal (MT)
83	mvb	Alberta Mountains	Cadomin-Luscar	177.0	87.0	67.5
			Rank Total	177.0	87.0	67.5
	lvb	Alberta Mountains	Smoky River	419.0	161.0	114.0
	hvb	British Columbia	Comox	16.0	15.0	0.0
	mvb	British Columbia	Crowsnest	575.0	455.0	384.0
				0.0	0.0	0.0
				0.0	0.0	0.0
			Elk Valley	0.0	0.0	0.0
			Rank Total	575.0	455.0	384.0
	m-hvb	British Columbia	Elk Valley	0.0	0.0	0.0
	bm	British Columbia	Elk Valley	1145.0	1085.0	725.0
	mvb	British Columbia	Peace River	0.0	0.0	0.0
				757.0	507.0	355.0
			Rank Total	757.0	507.0	355.0

Table 3
Coal Reserves in Canada by Rank 1 March 1987

Year	Coal Rank	Province	Coalfield	Mineable Seams(MT)	Recoverble Coal (MT)	Clean Coal (MT)
82		Nova Scotia	Cumberland-Spri nghill	0.1	0.1	0.1
	hvb	Nova Scotia	Inverness	2.8	1.4	1.4
		Nova Scotia	Pictou	0.2	0.1	0.0
	hvb	Nova Scotia	Sydney	809.0	443.0	339.0
				0.0	0.0	0.0
				0.0	0.0	0.0
		New Brunswick	Minto	5.8	5.7	5.7
			Rank Total	814.8	448.7	344.7
		New Brunswick	Beersville	13.6	12.2	12.2
	lig	Saskatchewan	Estevan	2121.0	1697.0	1697.0
				0.0	0.0	0.0
				0.0	0.0	0.0
				0.0	0.0	0.0
			Willow Bunch	0.0	0.0	0.0
			Rank Total	2121.0	1697.0	1697.0
	sub	Alberta Plains	Alix	4.2	2.9	0.0
			Ardley	1.8	1.5	0.0
			Rank Total	6.0	4.4	0.0
	sub C	Alberta Plains	Battle River	148.0	90.0	90.0
	sub C	Alberta Plains	Battle River	0.0	0.0	0.0
				0.0	0.0	0.0
			Rank Total	0.0	0.0	0.0
	sub C	Alberta Plains	Sheerness	170.0	126.0	126.0
	sub B	Alberta Plains	Wabamun	675.0	518.0	0.0
				0.0	0.0	0.0
			Rank Total	675.0	518.0	0.0
	sub	Alberta Plains	Drumheller	42.0	10.5	0.0
			Mayerthorpe	3.1	2.0	0.0
			Morinville	12.7	8.3	0.0
			Red Deer	6.0	4.4	0.0
			Rank Total	63.8	25.2	0.0
	lig	Alberta Plains	Thorhild Abee	1.6	1.2	0.0
	sub	Alberta Plains	Tofield Dodds	1.3	1.0	0.0
			Wetaskiwin	250.0	155.0	0.0
			Rank Total	251.3	156.0	0.0

Table 3
Coal Reserves in Canada by Rank

1 March 1987

Year	Coal Rank	Province	Coalfield	Mineable Seams(MT)	Recoverble Coal (MT)	Clean Coal (MT)
82	hvb BC	Alberta Foothills	Coalspur	153.0	125.0	0.0
	hvb	Alberta Foothills	Obed Marsh	188.0	147.0	91.0
	mvb	Alberta Foothills	Cadomin-Luscar	182.0	91.0	70.0
		British Columbia	Comox	16.0	15.0	10.0
	mvb	British Columbia	Crowsnest	596.0	472.0	397.0
				0.0	0.0	0.0
				0.0	0.0	0.0
				0.0	0.0	0.0
			Rank Total	596.0	472.0	397.0
	lvb-mv	British Columbia	Elk Valley	1166.0	1102.0	735.0
	mvb	British Columbia	Elk Valley	0.0	0.0	0.0
	m-hvb	British Columbia	Elk Valley	0.0	0.0	0.0
	lvb	Alberta Mountains	Smoky River	422.0	163.0	117.0
				0.0	0.0	0.0
			Rank Total	422.0	163.0	117.0

Table 3
Coal Reserves in Canada by Rank

1 March 1987

Year	Coal Rank	Province	Coalfield	Mineable Seams(MT)	Recoverble Coal (MT)	Clean Coal (MT)
81	hvb	Nova Scotia	Inverness	2.8	1.4	0.0
			Sydney	814.0	447.0	342.0
				0.0	0.0	0.0
				0.0	0.0	0.0
			Rank Total	816.8	448.4	342.0
	hvb A	Nova Scotia	Sydney	0.0	0.0	0.0
	hvb	New Brunswick	Minto	5.8	5.7	5.7
	lig	New Brunswick	Minto	5.8	5.7	5.7
		Saskatchewan	Estevan	0.0	0.0	0.0
				0.0	0.0	0.0
				0.0	0.0	0.0
				0.0	0.0	0.0
			Estevan (Willowbunch)	0.0	0.0	0.0
			Rank Total	5.8	5.7	5.7
	sub C	Alberta Plains	Battle River	152.0	93.0	0.0
				0.0	0.0	0.0
				0.0	0.0	0.0
			Rank Total	152.0	93.0	0.0
	sub C	Alberta Plains	Sheerness	170.0	126.0	0.0
	sub B	Alberta Plains	Wabamun	687.0	529.0	0.0
	mvb	Alberta Mountains	Cadomin-Luscar	185.0	94.0	76.0
	lvb	Alberta Mountains	Smoky River	424.0	165.0	115.0
				0.0	0.0	0.0
			Rank Total	424.0	165.0	115.0
	mvb	British Columbia	Crowsnest	608.0	482.0	405.0
				0.0	0.0	0.0
				0.0	0.0	0.0
			Rank Total	608.0	482.0	405.0
	lvb-mv	British Columbia	Elk Valley	1173.0	1108.0	740.0
	mvb	British Columbia	Elk Valley	0.0	0.0	0.0
	m-hvb	British Columbia	Elk Valley	0.0	0.0	0.0
	mvb	British Columbia	Peace River	759.0	509.0	357.0
				0.0	0.0	0.0

Table 3

Coal Reserves in Canada by Rank

1 March 1987

Year	Coal Rank	Province	Coalfield	Mineable Seams(MT)	Recoverble Coal (MT)	Clean Coal (MT)
(Break keys from prior page)						
81	mvbvbv	British Plains	Peace Rivercar			
			Rank Total	759.0	509.0	357.0
81	lig	British Columbia	Hat Creek	739.0	566.0	0.0

Table 3
Coal Reserves in Canada by Rank 1 March 1987

Year	Coal Rank	Province	Coalfield	Mineable Seams(MT)	Recoverble Coal (MT)	Clean Coal (MT)
82		British Columbia	Hat Creek	0.0	0.0	0.0
	mvb	British Columbia	Peace River	757.0	507.0	0.0

Table 3
Coal Reserves in Canada by Rank

1 March 1987

Year	Coal Rank	Province	Coalfield	Mineable Seams(MT)	Recoverble Coal (MT)	Clean Coal (MT)
81	hvb	Nova Scotia	Cumberland-Springhill	0.1	0.1	0.0
			Pictou	0.2	0.1	0.0
			Sydney	0.0	0.0	0.0
		New Brunswick	Beersville	13.6	12.2	12.2
			Rank Total	13.9	12.4	12.2
	sub	Alberta Plains	Drumheller	41.0	10.0	0.0
			Wetaskiwin	250.0	155.0	0.0
			Rank Total	291.0	165.0	0.0
	bt	Alberta Foothills	Obed Marsh	145.0	110.0	0.0
	hvb	British Columbia	Comox	16.0	15.0	10.0

Table 3
Coal Reserves in Canada by Rank 1 March 1987

Year	Coal Rank	Province	Coalfield	Mineable Seams(MT)	Recoverble Coal (MT)	Clean Coal (MT)
83	sub	Alberta Plains	Alix	4.2	2.9	0.0

Table 3
Coal Reserves in Canada by Rank

1 March 1987

Year	Coal Rank	Province	Coalfield	Mineable Seams(MT)	Recoverble Coal (MT)	Clean Coal (MT)
81	hvb BC	Alberta Foothills	Coalspur	158.0	130.0	78.0
	sub	Alberta Plains	Wabamun			

REPORT TABLE 4

Table 4

Coal Reserves in Canada by Likely Mining Method 01/03/87

Year	Coal Rank	Province	Coalfield	Mining Method	C/Recov MT
83	lig	Saskatchewan	Estevan	S-DR	0.0
					1682.0
					0.0
					0.0
			Willow Bunch	S-DR	0.0
				Rank Total	1682.0
	hvb	Nova Scotia	Cumberland-Springhill		0.1
			Inverness	UG-RP	1.4
			Pictou		0.1
			Sydney	UG-LW	0.0
					436.0
					0.0
		New Brunswick	Minto	S-DR	4.7
			Beersville		12.2
				Rank Total	454.5
	sub	Alberta Plains	Ardley		1.5
		Alberta Plains	Battle River	S-DR	87.0
	sub	Alberta Plains	Battle River	S-DR	0.0
					0.0
				Rank Total	0.0
	sub	Alberta Plains	Drumheller		10.5
			Mayerthorp		2.0
			Morinville		8.3
			Red Deer		4.4
			Sheerness	S-DR	126.0
				Rank Total	151.2
	lig	Alberta Plains	Thorhild-Abee		1.2
	sub	Alberta Plains	Tofield-Dodds		1.0
	sub B	Alberta Plains	Wabamun	S-DR	507.0
					0.0
				Rank Total	507.0
	sub	Alberta Plains	Wetaskiwin		155.0
	hvb BC	Alberta Foothills	Coalspur	S-TS	207.0
	hvb	Alberta Foothills	McLeod River		254.0
			Obed Marsh	S-TS	147.0
				Rank Total	401.0
	mvb	Alberta Mountains	Cadomin-Luscar	S-TS	0.0
					87.0

Table 4

Coal Reserves in Canada by Likely Mining Method 01/03/87

Year	Coal Rank	Province	Coalfield	Mining Method	C/Recov MT
(Break keys from prior page)					
83	mvb	BC Alberta Plains	Cadomin-Luscari	S-TSW	
				Rank Total	87.0
83	lvb	Alberta Mountains	Smoky River	S-TS	161.0
	hvb	British Columbia	Comox		15.0
	mvb	British Columbia	Crowsnest	S-TS	455.0
					0.0
				UG-RP	0.0
			Elk Valley	S-TS	0.0
				Rank Total	455.0
	m-hvb	British Columbia	Elk Valley	S-TS	0.0
	bm	British Columbia	Elk Valley	S-TS	1085.0
	mvb	British Columbia	Peace River	S-TS	0.0
					507.0
				Rank Total	507.0
				Year Total	5958.4

Table 4

Coal Reserves in Canada by Likely Mining Method 01/03/87

Year	Coal Rank	Province	Coalfield	Mining Method	C/Recov MT
82		Nova Scotia	Cumberland-Springhill		0.1
	hvb	Nova Scotia	Inverness	UG-RP	1.4
		Nova Scotia	Pictou		0.1
	hvb	Nova Scotia	Sydney	UG-LW	443.0
					0.0
					0.0
		New Brunswick	Minto	S-DR	5.7
				Rank Total	448.7
		New Brunswick	Beersville		12.2
	lig	Saskatchewan	Estevan	S-DR	1697.0
					0.0
					0.0
					0.0
			Willow Bunch	S-DR	0.0
				Rank Total	1697.0
	sub	Alberta Plains	Alix		2.9
			Ardley		1.5
				Rank Total	4.4
	sub C	Alberta Plains	Battle River	S-DR	90.0
	sub C	Alberta Plains	Battle River	S-DR	0.0
					0.0
				Rank Total	0.0
	sub C	Alberta Plains	Sheerness	S-DR	126.0
	sub B	Alberta Plains	Wabamun	S-DR	518.0
					0.0
				Rank Total	518.0
	sub	Alberta Plains	Drumheller		10.5
			Mayerthorpe		2.0
			Morinville		8.3
			Red Deer		4.4
				Rank Total	25.2
	lig	Alberta Plains	Thorhild Abee		1.2
	sub	Alberta Plains	Tofield Dodds		1.0
			Wetaskiwin		155.0
				Rank Total	156.0

Coal Reserves in Canada by Likely Mining Method 01/03/87

Year	Coal Rank	Province	Coalfield	Mining Method	C/Recov MT
82	hvb BC	Alberta Foothills	Coalspur	S-TS	125.0
	hvb	Alberta Foothills	Obed Marsh	S-TS	147.0
	mvb	Alberta Foothills	Cadomin-Luscar	S-TS	91.0
		British Columbia	Comox		15.0
	mvb	British Columbia	Crowsnest	S-TS	472.0
					0.0
				UG-RP	0.0
					0.0
				Rank Total	472.0
	lvb-mv	British Columbia	Elk Valley	S-TS	1102.0
	mvb	British Columbia	Elk Valley	S-TS	0.0
	m-hvb	British Columbia	Elk Valley	S-TS	0.0
	lvb	Alberta Mountains	Smoky River	S-TS	163.0
				UG-RP	0.0
				Rank Total	163.0
				Year Total	5195.3

Table 4

Coal Reserves in Canada by Likely Mining Method 01/03/87

Year	Coal Rank	Province	Coalfield	Mining Method	C/Recov MT
81	hvb	Nova Scotia	Inverness	UG-RP	1.4
			Sydney	UG-LW	447.0
					0.0
					0.0
				Rank Total	448.4
	hvb A	Nova Scotia	Sydney	S-DR	0.0
	hvb	New Brunswick	Minto	S-DR	5.7
	lig	New Brunswick	Minto	S-DR	5.7
		Saskatchewan	Estevan	S-DR	0.0
					0.0
					0.0
					0.0
			Estevan (Willowbunch)	S-DR	0.0
				Rank Total	5.7
	sub C	Alberta Plains	Battle River	S-DR	93.0
					0.0
					0.0
				Rank Total	93.0
	sub C	Alberta Plains	Sheerness	S-DR	126.0
	sub B	Alberta Plains	Wabamun	S-DR	529.0
	mvb	Alberta Mountains	Cadomin-Luscar	S-TS	94.0
	lvb	Alberta Mountains	Smoky River	S-TS	165.0
				UG-RP	0.0
				Rank Total	165.0
	mvb	British Columbia	Crowsnest	S-TS	482.0
					0.0
				UG-RP	0.0
				Rank Total	482.0
	lvb-mv	British Columbia	Elk Valley	S-TS	1108.0
	mvb	British Columbia	Elk Valley	S-TS	0.0
	m-hvb	British Columbia	Elk Valley	S-TS	0.0
	mvb	British Columbia	Peace River	S-TS	509.0
					0.0

Table 4

Coal Reserves in Canada by Likely Mining Method 01/03/87

Year	Coal Rank	Province	Coalfield	Mining Method	C/Recov MT
(Break keys from prior page)					
	81 mvbvbv	British Plains	Peace Rivercar	S-TSP	
				Rank Total	509.0
	81 lig	British Columbia	Hat Creek		566.0
				Year Total	4131.8

Table 4

Coal Reserves in Canada by Likely Mining Method 01/03/87

Year	Coal Rank	Province	Coalfield	Mining Method	C/Recov MT
82		British Columbia	Hat Creek		0.0
	mvb	British Columbia	Peace River		507.0
				Year Total	507.0

Table 4

Coal Reserves in Canada by Likely Mining Method

01/03/87

Year	Coal Rank	Province	Coalfield	Mining Method	C/Recov MT
81	hvb	Nova Scotia	Cumberland-Springhill		0.1
			Pictou		0.1
			Sydney	UG-LW	0.0
		New Brunswick	Beersville		12.2
				Rank Total	12.4
	sub	Alberta Plains	Drumheller		10.0
			Wetaskiwin		155.0
				Rank Total	165.0
	bt	Alberta Foothills	Obed Marsh		110.0
	hvb	British Columbia	Comox		15.0
				Year Total	302.4

Coal Reserves in Canada by Likely Mining Method 01/03/87

Year	Coal Rank	Province	Coalfield	Mining Method	C/Recov MT
83	sub	Alberta Plains	Alix		2.9

Table 4

Coal Reserves in Canada by Likely Mining Method

01/03/87

Year	Coal Rank	Province	Coalfield	Mining Method	C/Recov MT
81	hvb BC	Alberta Foothills	Coalspur	S-TS	130.0
	sub	Alberta Plains	Wabamun	S-DR	
				Year Total	130.0

REPORT TABLE 5

Table 5
Changes in Recoverable Coal Reserves 01/03/87

Year	Province		C/Recov MT
83	Saskatchewan		0.0
			1682.0
			0.0
			0.0
			0.0
		Total	1682.0
	Nova Scotia		0.1
			1.4
			0.1
			0.0
			436.0
			0.0
		Total	437.6
	New Brunswick		4.7
			12.2
		Total	16.9
	Alberta Plains		1.5
			87.0
			0.0
			0.0
			10.5
			2.0
			8.3
			4.4
			126.0
			1.2
			1.0
			507.0
			0.0
			155.0
		Total	903.9
	Alberta Foothills		207.0
			254.0
			147.0
		Total	608.0
	Alberta Mountains		0.0
			87.0
			161.0
		Total	248.0
	British Columbia		15.0
			455.0
			0.0
			0.0
			0.0
			0.0
			1085.0
			0.0
			507.0
		Total	2062.0

Table 5
Changes in Recoverable Coal Reserves

01/03/87

Year	Province	C/Recov MT
(Break keys from prior page)		
83	British Columbias	
	Total	5958.4
82	Nova Scotia	0.1
		1.4
		0.1
		443.0
		0.0
		0.0
	Total	444.6
	New Brunswick	5.7
		12.2
	Total	17.9
	Saskatchewan	1697.0
		0.0
		0.0
		0.0
		0.0
	Total	1697.0
	Alberta Plains	2.9
		1.5
		90.0
		0.0
		0.0
		126.0
		518.0
		0.0
		10.5
		2.0
		8.3
		4.4
		1.2
		1.0
		155.0
	Total	920.8
	Alberta Foothills	125.0
		147.0
		91.0
	Total	363.0
	British Columbia	15.0
		472.0
		0.0
		0.0
		0.0
		1102.0
		0.0
		0.0
	Total	1589.0
	Alberta Mountains	163.0
		0.0

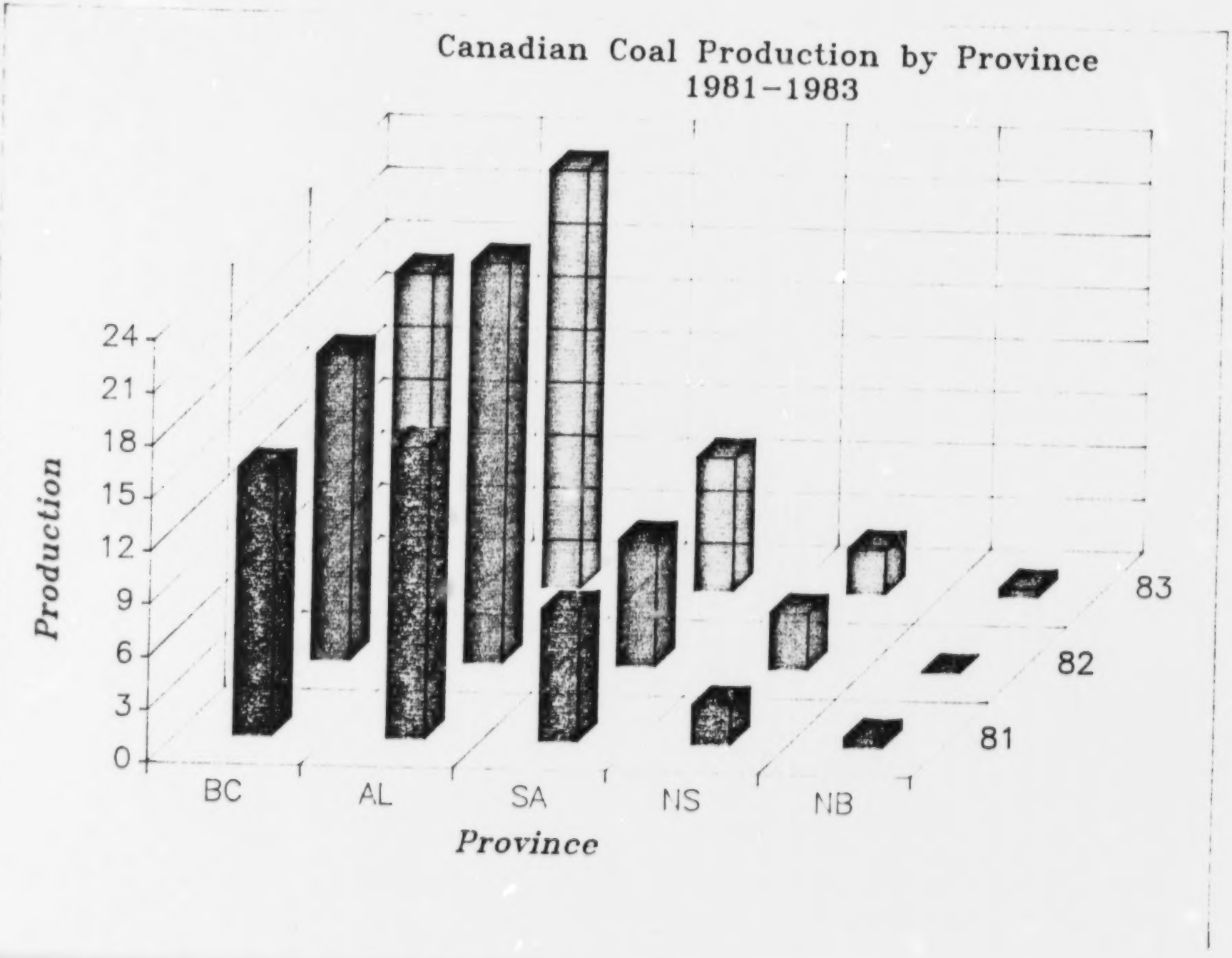
Table 5
Changes in Recoverable Coal Reserves 01/03/87

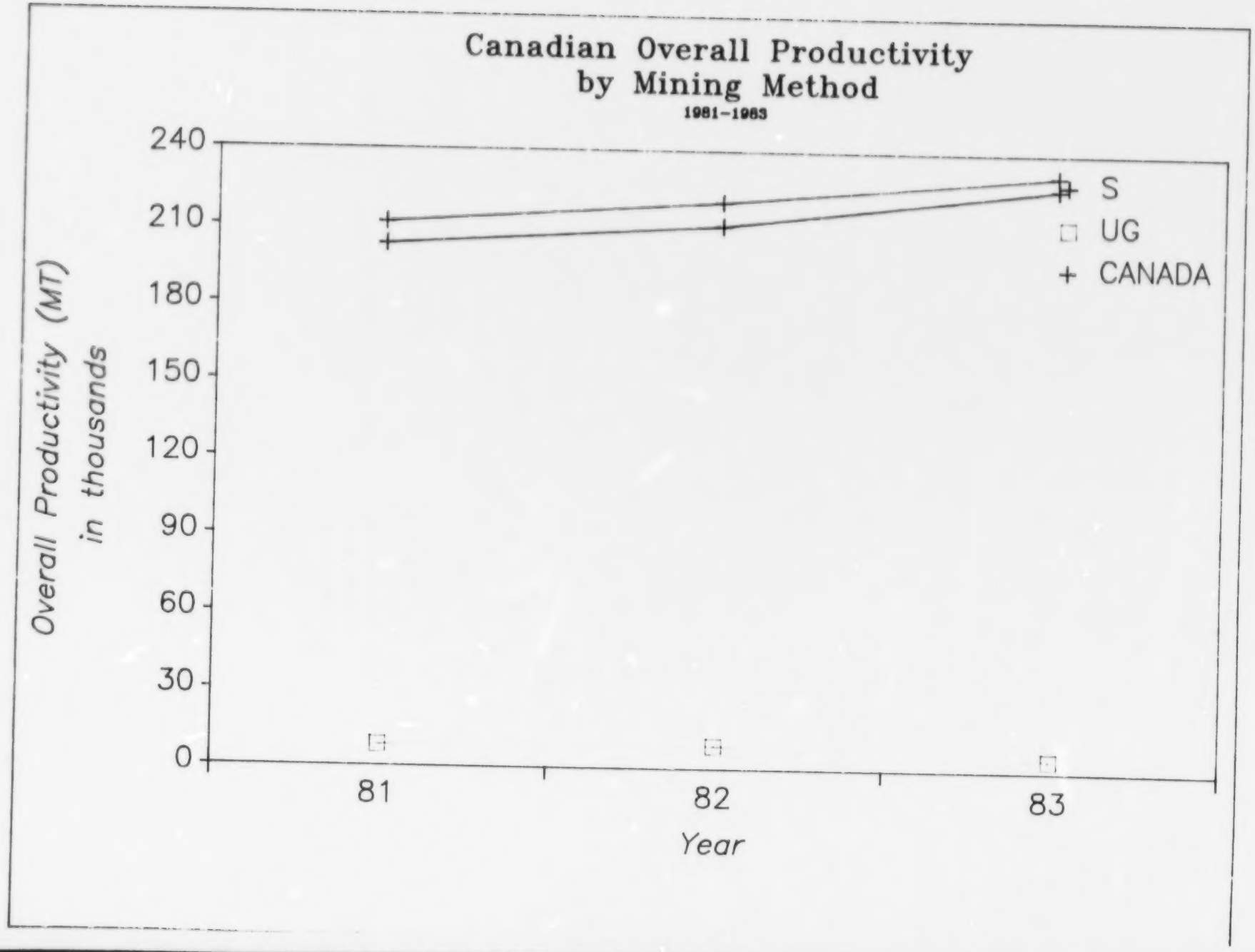
Year	Province	C/Recov MT
(Break keys from prior page)		
82	Alberta Mountains	
	Total	163.0
	Total	5195.3
81	Nova Scotia	1.4
		447.0
		0.0
		0.0
		0.0
	Total	448.4
	New Brunswick	5.7
		5.7
	Total	11.4
	Saskatchewan	0.0
		0.0
		0.0
		0.0
		0.0
	Total	0.0
	Alberta Plains	93.0
		0.0
		0.0
		126.0
		529.0
	Total	748.0
	Alberta Mountains	94.0
		165.0
		0.0
	Total	259.0
	British Columbia	482.0
		0.0
		0.0
		1108.0
		0.0
		0.0
		509.0
		0.0
		566.0
	Total	2665.0
	Total	4131.8
82	British Columbia	0.0

Table 5
Changes in Recoverable Coal Reserves

01/03/87

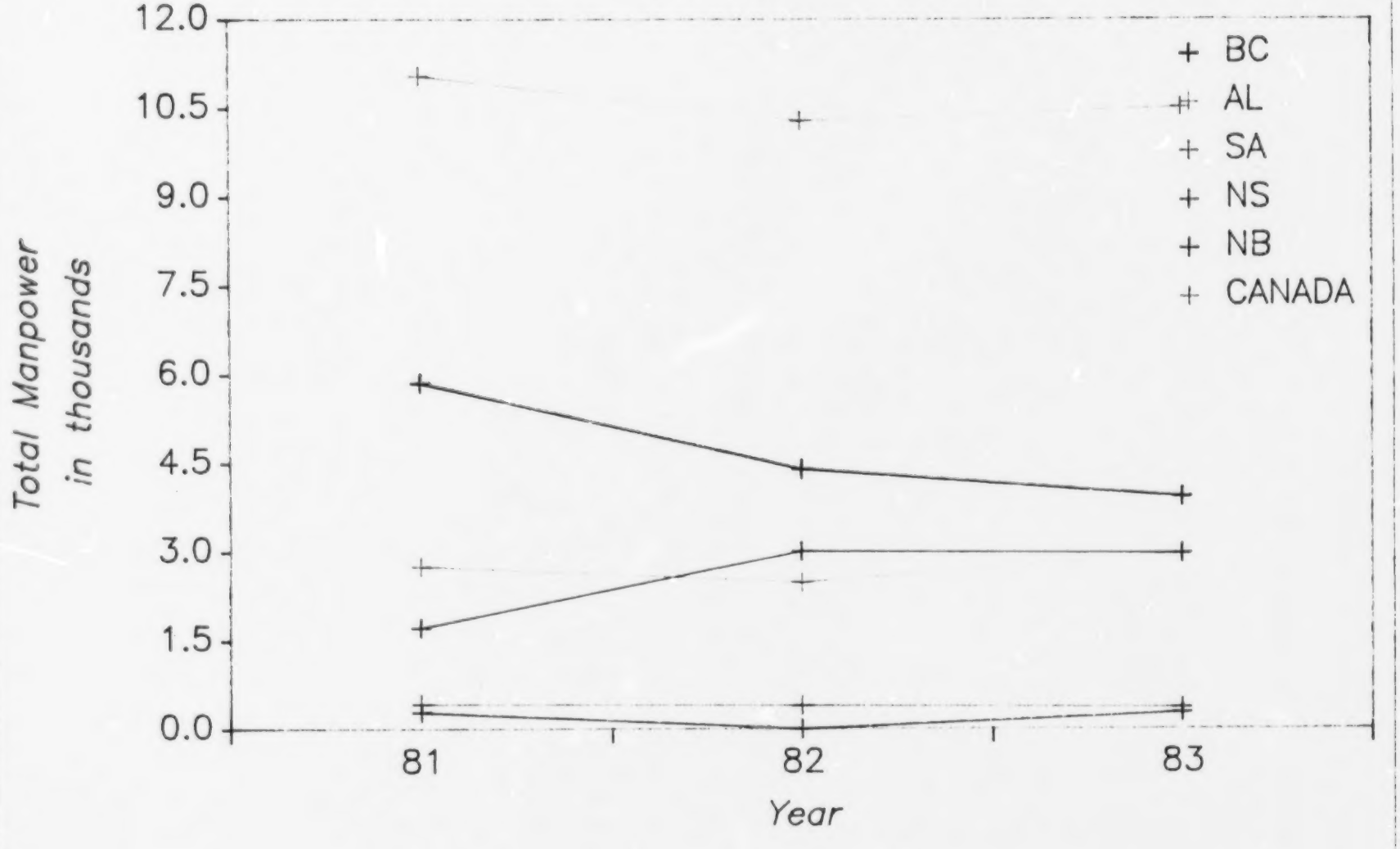
Year	Province	C/Recov MT
(Break keys from prior page)		
82	British Columbia	
	Total	507.0
	Total	507.0
81	Nova Scotia	0.1
		0.1
		0.0
	Total	0.2
	New Brunswick	12.2
	Alberta Plains	10.0
		155.0
	Total	165.0
	Alberta Foothills	110.0
	British Columbia	15.0
	Total	302.4
83	Alberta Plains	2.9
81	Alberta Foothills	130.0
	Alberta Plains	
	Total	130.0

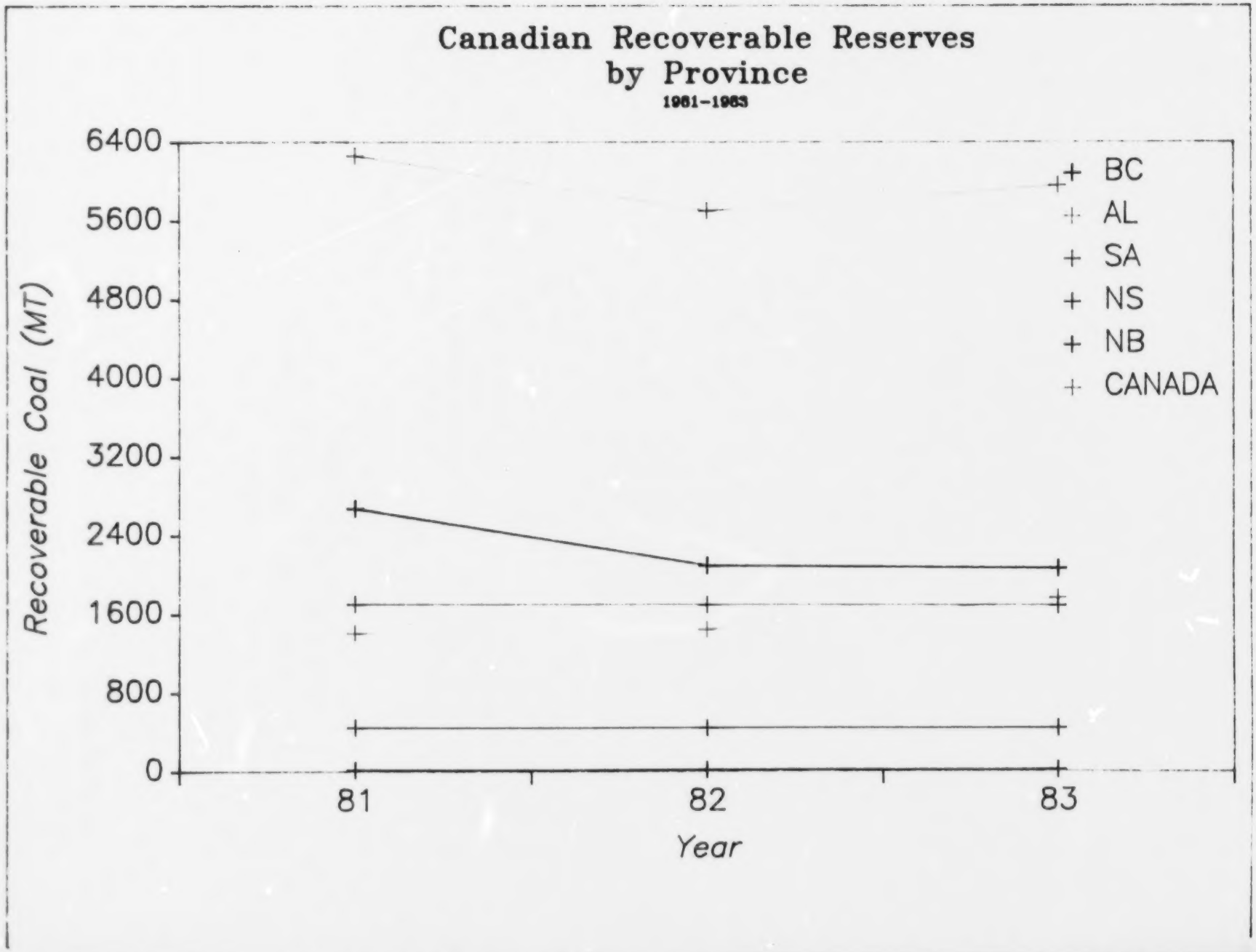

Canadian Coal Production by Province
1981–1983
Production
24
21
18
15
12
9
6
3
0
BC
AL
SA
NS
NB
Province
81
82
83

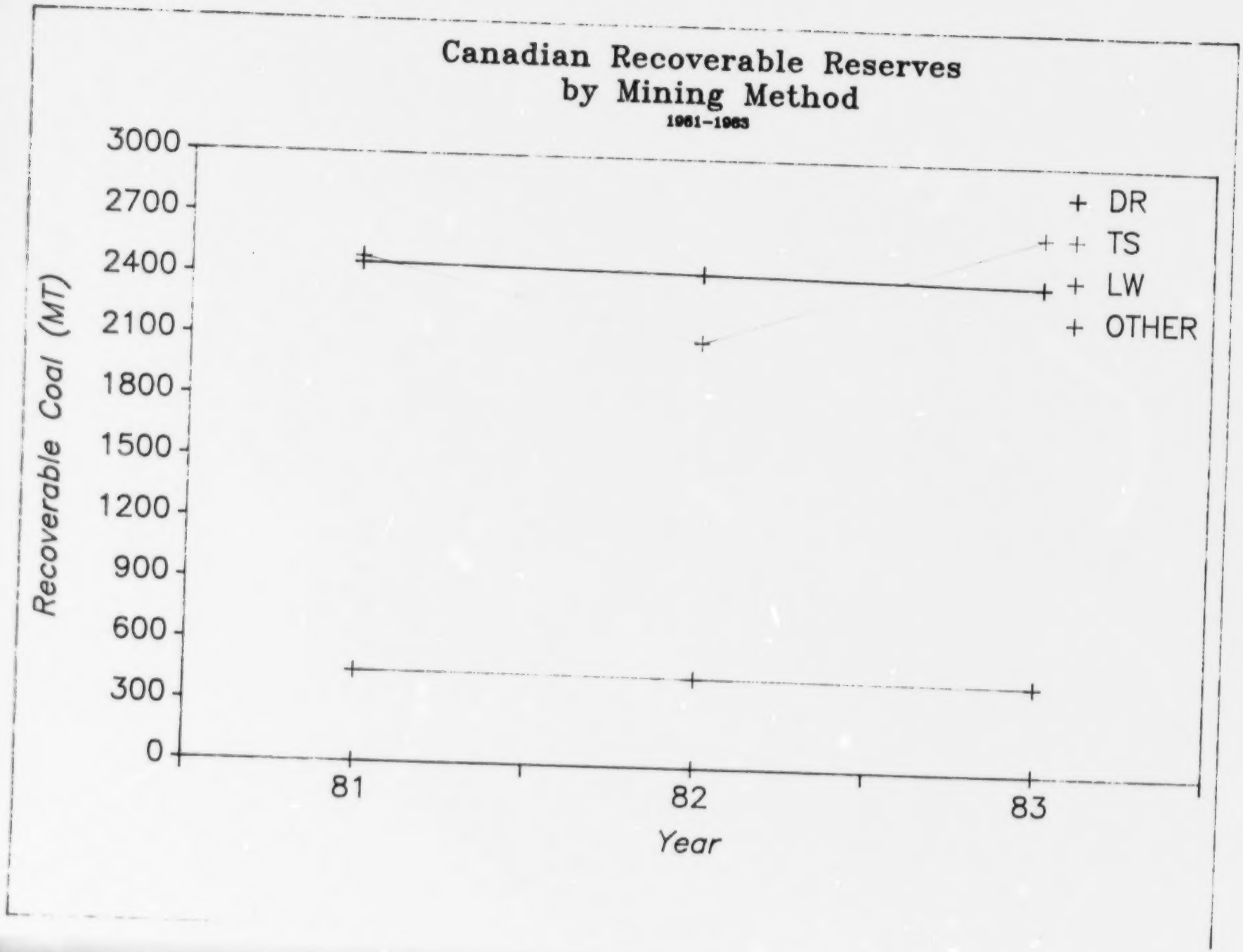

Canadian Overall Productivity
by Mining Method
1981-1983
240
210
180
150
120
90
60
30
0
Overall Productivity (MT)
in thousands
81
82
83
Year
S
UG
CANADA

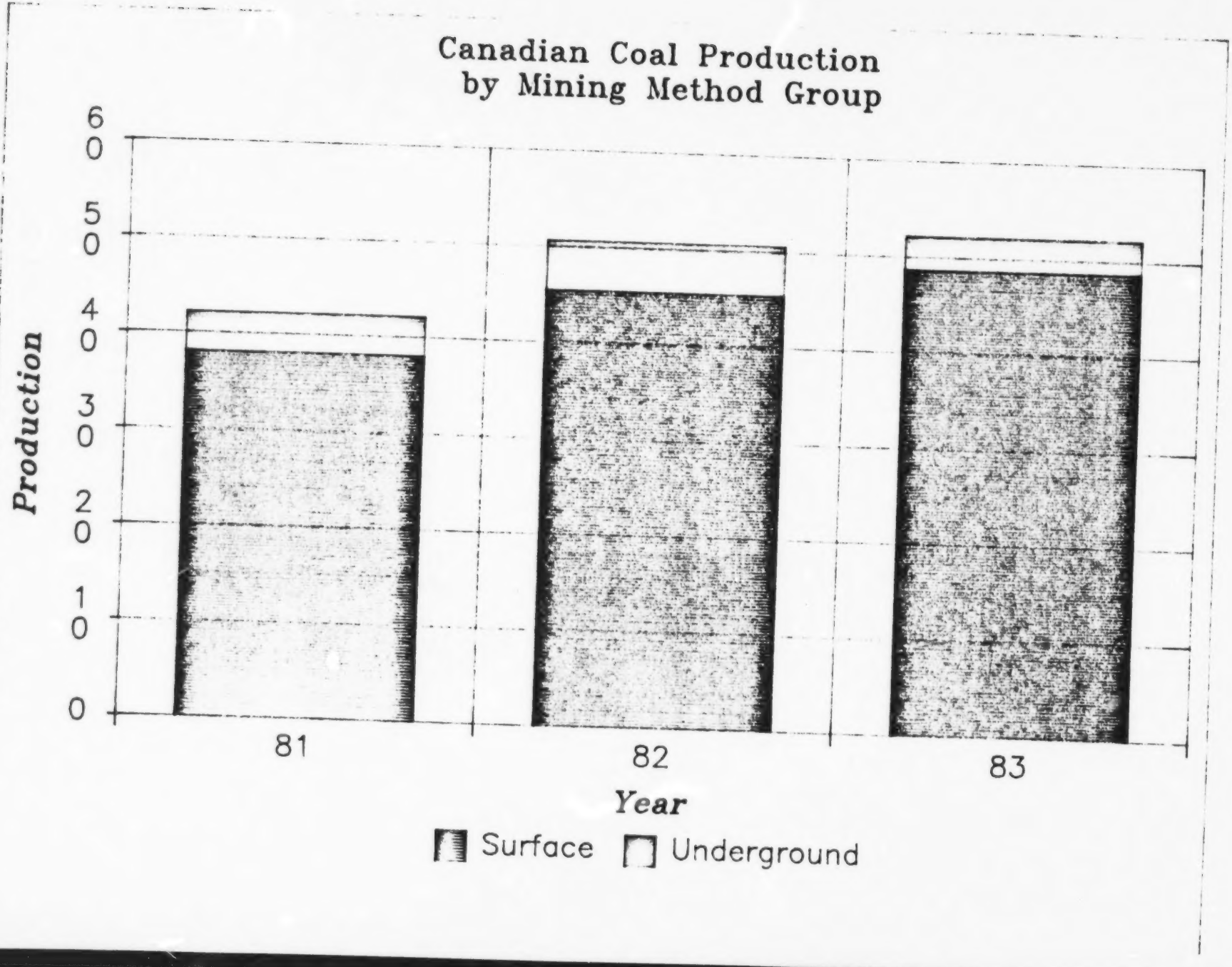
Canadian Coal Manpower Statistics by Province

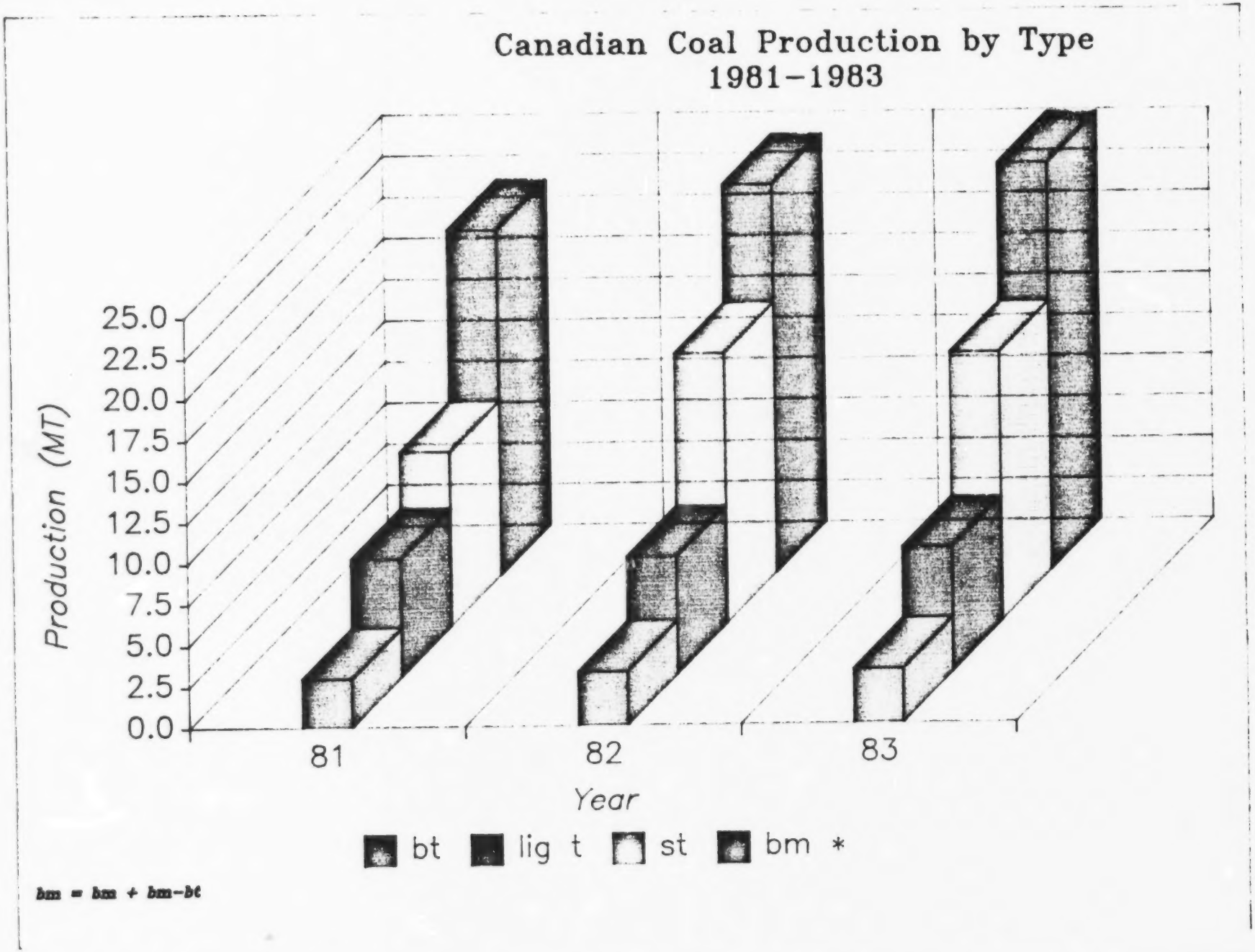
1981-1983

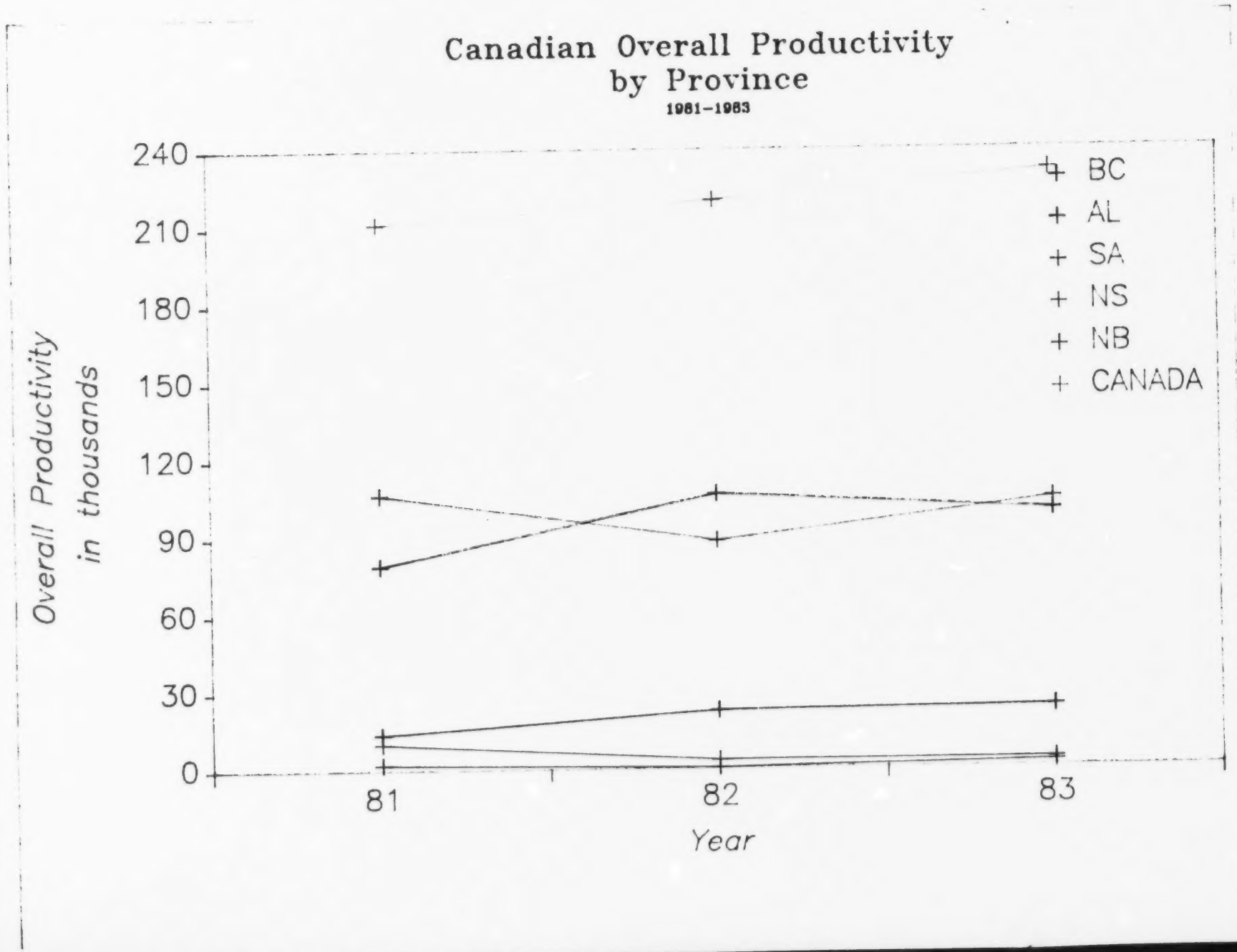



Canadian Recoverable Reserves
by Province
1981-1983
Recoverable Coal (MT)
6400
5600
4800
4000
3200
2400
1600
800
0
81
82
83
Year
BC
AL
SA
NS
NB
CANADA


Canadian Recoverable Reserves
by Mining Method
1961-1983
Recoverable Coal (MT)
3000
2700
2400
2100
1800
1500
1200
900
600
300
0
81
82
83
Year
DR
TS
LW
OTHER


Canadian Coal Production
by Mining Method Group
Production
60
50
40
30
20
10
0
81
82
83
Year
Surface
Underground


Canadian Coal Production by Type
1981–1983
Production (MT)
25.0
22.5
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
81
82
83
Year
bt
lig t
st
bm *
bm = bm + bm-bt


Canadian Overall Productivity
by Province
1981-1983
240
210
180
150
120
90
60
30
0
81
82
83
Year
Overall Productivity
in thousands
BC
AL
SA
NS
NB
CANADA

Canadian Coal Production by Mining Method 1981–1983